Connecting for Child Health: Lessons from Obesity

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Connecting for (child) health? Lessons from obesity

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Questions

• Can child health e-records shed new light on the obesity epidemic?

• Should (child) health information systems be designed on a public health basis?

Three Spheres, M.C. Escher, 1946
Patho-physiology of excess fat

- big mass heart works harder changes of hypertension
- high cholesterol and low HDL:LDL ratio
- insulin resistance
- altered hormone metabolism
- altered liver function
- musculoskeletal stresses
- breathing impairment
- altered intestinal function
- mood alteration

- Just starting to understand the interaction of these factors in pathologies such as metabolic syndrome:
  - central obesity + dyslipidaemia + hypertension + diabetes
  - causes early death & strongly predicted by childhood obesity

Metabolic ill-health leading to...

- Early death
  - a decade less life in the obese
    - more in smokers
    - less in physically active

- Suffering through:
  - cardiovascular disease
  - diabetes
  - osteoarthritis
  - low self-esteem and social functioning
  - some cancers (colorectal, ovarian, endometrial)
  - liver and intestinal disorders
  - sexual dysfunction
  - sleep apnoea
Evidence needed

- Do adult obesity related disorders start in childhood?

- Can promotion of metabolic health in childhood prevent obesity and related disorders throughout life?

Epidemiology’s Everest

Data required to understand obesity:

- Adiposity as fat distribution (subcutaneous, visceral, ectopic) and amount
- Serial measurements of adiposity across the life-course
- Accurate data on energy balance
- Contemporary measurements of the early natural histories of obesity-related diseases
Common sense based policy

- Need 60+ year follow-up studies to be sure that child obesity is a grave problem: Insufficient data from old cohorts
- Fat children now become fat adults
- Risk in adults is cumulative
- Precaution

Can more be discovered from extant, crude data?
Body Mass Index (BMI)

- Weight for height
- A crude measure of *adiposity*
- $\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}$
- Not ideal for measuring individual adiposity but useful for monitoring change over time in *populations*.

Intelligence from routinely-collected but *not* routinely analysed data:

Obesity in Wirral 3-yr-olds, 88 to 03...
Rising fatness of Wirral 3yr olds from 1988 to 2003

Body Mass Index (BMI) trend in Wirral 3y-olds from 1988 to 2003

-0.4 -0.3 -0.2 -0.1 0 0.1 0.2 0.3 0.4 0.5

Three-monthly rolling average BMI SDS

Month of measurement by Health Visitor

SDD = standard deviation score from 1990 British Growth Reference charts – adjusts for age and sex of the child

Information utility

- Large samples
  - Approx. 30-75% coverage of population

- Data quality varies
  - Health visiting and school sources
  - Careful cleaning & interpretation
  - Corroborate findings across localities
International Obesity Taskforce classification applied to Manchester school children 2000 to 2004

Girls were 1.55 (95% CI 1.29 to 1.87) times more likely than boys to be overweight or obese
Typical recent trend: Liverpool 10yr olds

Routine data - stimulating science:

At what age do signs of the obesity epidemic appear?
Birth-weight and BMI at 3 years for children born on Wirral between 1985 and 2000

Strongest trends: Rise in BMI at 2 & 3 years and infant length for children born on Wirral between 1990 and 2000
Has the obesity epidemic cut through the social divisions that influence child health?

Behind the question

- Apparent ‘spread’ of obesity
- Many social factors implicated in the putative ‘obesogenic environment’
Population ‘data labs’

- Large proportion measured consistently over a long period
- Low migration
- Diversity of exposure(s) of interest
- Reliable e-records

Wirral (0.3M), UK

Child poverty map
(households with children: % on benefits in 2001-3)

Fifths of IDAC 2004
Red (light) = most deprived
Red (dark)
Purple
Blue (dark)
Blue (light) = most affluent
Babies from affluent areas born heavier still


3 year olds in affluent areas ‘caught up’ BMI

Wirral 3 year old BMI for age and gender from 1988 to 2003, by fifth of IDAC 2004
3 year olds in affluent areas ‘caught up’ BMI

Obesity epidemic in Wirral 3 year olds from 1988 to 2003, expressed as weight for height, gender, age and birth-weight:

Most deprived fifth put on 40 (35-46) grams per year.

Least deprived fifth put on 57 (49-65) grams per year.

Overweight at 3y ‘caught up’ in affluent areas

% overweight or obese by IOTF classification in Wirral from 1988 to 2003, by fifth of IDAC 2004
**Overweight at 3y ’caught up’ in affluent areas**

Obesity epidemic in Wirral 3 year olds from 1988 to 2003, expressed as annual percentage increase in the proportion overweight or obese by IOTF classification, independently of gender, age and birth-weight:

Most deprived fifth increased at $4.2 \ (3.2-5.2) \ % \ per \ year$.

Least deprived fifth increased at $7.1 \ (5.2-8.9) \ % \ per \ year$.

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**Available ‘labs’ are socially different**

[min - lower quartile - median - upper quartile - max]

of proportion of households, in small area, with children on benefits
Birth-weight and early weight-gain

- Birth-weight risen a little in all social groups – less so than later BMI
- Most affluent still heaviest babies
- Most deprived catching up in early infant weight-gain

Pre-school BMI

- Mixed picture:
  - Affluent ‘catching up’
  - Persistent inverse social gradient
  - Persistent lack of social gradient
BMI in older children

- Social gradient emerges around the time of starting school, but **only in girls**
  - i.e. girls but not boys from deprived areas are fatter than affluent peers

- Gender difference has grown more in deprived than affluent areas

**Women and not men from low-income households are fatter in England**

(Data from Health Survey for England)
Women from low-income households and men from high-income households are fatter in Greater Manchester

...height and linear growth are socially sensitive, so how did they change with BMI across the 1990s?...
Increasing correlation between height and weight in Wirral 3-yr-olds 88 to 03 ? Growth effect

Source: Buchan et al., pre-publication

Secular trend to increasing BMI is much greater in taller children

Source: Buchan et al., pre-publication
Faster infant growth and slower early child growth

Adiposity fluctuates less in young children than it used to
...if fat is sticking more through childhood what is happening to physical fitness...

Rise in BMI and fall in cardio-respiratory endurance of Liverpool 10 year olds from 1998 to 2004

Data from G Stratton, Liverpool Sportline
Cardio-respiratory endurance levels of Liverpool 10 year olds fell in all BMI groups

![Graph showing shuttle runs completed by BMI groups across different school years.]

BMI of Liverpool 10 year olds rose irrespective of cardio-respiratory endurance

![Graph showing BMI levels by fitness level across different school years.]

Data from G Stratton, Liverpool Sportlink.
Discoveries from service e-records

The obesity epidemic in children:

• Concurred with accelerating infant growth
• Showed a temporo-spatial spread pattern
• Ignored socio-economic groups
• Affected the physically fit and unfit alike

Monitoring population BMI

• Avoid sample surveys
  – Insufficient statistical power for locally useful information
  – Lose opportunity to promote health as health behaviours are forming
BMI monitoring: Explain

- Explain the need for evidence to all

- NOT screening
  - No simple BMI cut-off for ‘at risk’ therefore can’t give specific advice
  - No evidence-based care pathway
  - No service capacity
  - Lifestyle ‘treatments’ benefit all

BMI monitoring: Engage

- Encourage local creativity and ownership
  - Rochdale PE lessons
  - Liverpool after-school sport, physical activity and healthy eating promotion
  - Birmingham maths lessons
  - Wirral fire service
BMI monitoring: Equip

- Use self-calibrating height measure e.g. Leicester

- Train personnel
  - in measuring
  - in stigma avoidance

- Easy data capture IT

BMI monitoring: E-records

- Spreadsheet template (stop-gap) PCT
  - School ID, name and postcode
  - Pupil ID, forename, last name, gender, ethnicity, date of birth, & home postcode from school database
  - Date of measurement
  - Height (cm to nearest 0.1cm)
  - Weight (kg to nearest 0.1kg)

- Anonymise analysis
  - Derived ID code for longitudinal linkage
  - Postcode SOA
  - Date of birth and measurement decimal age
  - Date of birth year and month of birth
Workflow to produce the Wirral maps

NHS
Depersonalise

Clean (rules)
Visualise
Clean (unanticipated)
Standardise
Clean (rules)
Visualise
Clean (unanticipated)
Record cleaning
Summarise

Reference

Post Office

ODPM

OS / ONS

Postcode
SOA
SOA deprivation
Visualise
Summarise
Model
Statistical findings

Summarise by SOA
SOA boundaries
Thematic maps

National obesity intelligence

- Timely maps and summary statistics
- National register of anti-obesity initiatives
  natural experiments
- Support research on anonymous records
- Disseminate emerging evidence
NHS information systems?

Ideally the cradle to grave

NHS care e-record
would contain measurements,
starting from booking clinic,
facilitating life-course epidemiology
that research funding bodies can’t afford

Child health    childhood origins of health

Rationale for NHS-wide records

• Financial
  – Reality

• Clinical
  – Slow to engage clinicians (push vs. pull)

• Public health
  – Great potential public good - neglected
Conclusions

- Child health data are key to understanding the obesity epidemic

- Child health information is a window on emerging population health

- Child health information systems (IT & people) should be prioritised for development on public health grounds